

SIMON FRASER UNIVERSITY

S.74-50

MEMORANDUM

To SENATE

From SENATE COMMITTEE ON UNDERGRADUATE
STUDIES

Subject NEW COURSE PROPOSALS -
MATH 154-3, 155-3, 194-3, 196-3

Date APRIL 18, 1974

MOTION 1:

"That Senate approve, as set forth in S.74-50,
the new course proposals for:

MATH 154-3 - Calculus I for the Biological Sciences
MATH 155-3 - Calculus II for the Biological Sciences
MATH 194-3 - Euclidean Geometry
MATH 196-3 - Modern Geometry."

MOTION 2:

"That Senate waive the normal two semester time
lag requirement in order that MATH 154-3 may be
first offered in the Fall semester 74-3."

(Note: MATH 195-3 - Introductory Geometry will be discontinued
on the introduction of MATH 194-3 and MATH 196-3.)

SIMON FRASER UNIVERSITY

S.74-50

MEMORANDUM

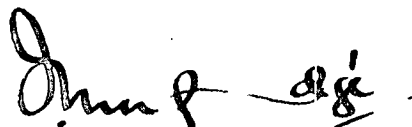
To..... SENATE

From..... Senate Committee on Undergraduate Studies

Subject..... New Course Proposals - Faculty of
Science

Date..... April 19, 1974

The Senate Committee on Undergraduate Studies has examined the following course proposals - Mathematics 154-3: Calculus I for the Biological Sciences; Mathematics 155-3: Calculus II for the Biological Sciences; Mathematics 194-3: Euclidean Geometry; and Mathematics 196-3: Modern Geometry. It is recommended that these courses be approved. It is further recommended that, should these proposals be accepted by Senate, the normal two semester time lag be waived in the case of Mathematics 154-3 so that it may be offered in the Fall semester, 1974.


I. Muir

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SIMON FRASER UNIVERSITY

MEMORANDUM

Senate Committee on
Undergraduate Studies
Subject NEW MATHEMATICS
COURSE PROPOSALS

From S. Aronoff *S. Aronoff*
Dean of Science
Date March 27, 1974

At its meeting of March 19, 1974 the Faculty of Science approved four new Mathematics courses as follows:

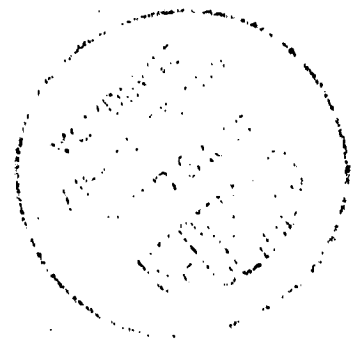
MATH 154-3 Calculus I for the Biological Sciences
MATH 155-3 Calculus II for the Biological Sciences
MATH 194-3 Euclidean Geometry
MATH 196-3 Modern Geometry

Attached is a rationale for the initiation of the calculus courses for the biological sciences, course proposal forms for 154 and 155 and a statement on the effect these courses have on the prerequisite structure of Mathematics courses. Additionally, there is a rationale for the replacement of MATH 195-3 with 194-3 and 196-3, and course proposal forms for these new courses as required.

It is to be noted that the intended initial offering of 154-3 is 74-3 which will require the approval of SCUS and such recommendation to Senate.

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cc: A.H. Lachlan, Chairman
Department of Mathematics



SIMON FRASER UNIVERSITY

MEMORANDUM

Dr. S. Aronoff

Dean of Science

Subject NEW COURSE PROPOSALS - Math 154-3
and Math 155-3

From Dr. A. H. Lachlan, Chairman

Mathematics Department

Date December 3, 1973

Following discussions with the Department of Biological Sciences, this Department agreed to split the first year calculus courses into two sections. One section was for students in Biology, and the other for those in Chemistry, Mathematics and Physics. This has been done on an experimental basis for the past two years and is considered to be worthwhile. One positive result is the reduction of class size, in the case of Math 151-3 from 250-300 students to lectures with 100-150 students in each section. For the past year, a textbook different from the one used in the regular section of Math 151-3 has been adopted and as a result, there have been syllabus changes. This is one of the reasons we are making formal proposals for new course numbers. The other reasons are to ease administrative procedures with respect to pre-registration in these courses. Without separate course numbers, it is difficult for the Registrar's Office to ensure that students register in the appropriate lecture and tutorial sections. During the experimental period this has resulted in tutorial assignments for the split calculus courses being done departmentally. The new course numbers will mean that these courses can be treated like the others in the pre-registration procedure.

A. H. Lachlan

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SENATE COMMITTEE ON UNDERGRADUATE STUDIESCOURSE PROPOSAL FORM1. Calendar InformationDepartment: MathematicsAbbreviation Code: _____ Course Number: 154-3 Credit Hours: 3 Vector: 3-1-0Title of Course: Calculus I for the Biological Sciences

Calendar Description of Course:

The logarithmic, trigonometric and exponential functions. Limits and continuity. The derivative and techniques of differentiation. Maxima, minima, the mean value theorem. Applications for the Biological Sciences.

Nature of Course Lecture/tutorial.

Prerequisites (or special instructions): Math 12 (B.C. Schools) or Mathematics 100-3. Students with other qualifications must consult an advisor in the Mathematics Department before they can be admitted to the course. Students who have received credit for either Mathematics 150-3 or 151-3 cannot receive credit for Mathematics 154-3.

What course (courses), if any, is being dropped from the calendar if this course is approved:

None.

2. SchedulingHow frequently will the course be offered? Twice per year, in the fall and spring semester.Semester in which the course will first be offered? Fall 1974

Which of your present faculty would be available to make the proposed offering possible?

All faculty members.3. Objectives of the Course

The objective of the course is to make the study of calculus more relevant to students in Biological Sciences. The difference between the topics discussed in Math 154-3 and those discussed in Math 151-3 is very small. The emphasis in Math 154-3 is placed on the application of techniques learned in calculus to problems in the Biological Sciences, wherever it is possible.

4. Budgetary and Space Requirements (for information only)

What additional resources will be required in the following areas:

Faculty There will be no net increase in faculty teaching time required for this course. For the past two years, the Department has offered separate sections of Math 151-3 in the Fall semester. One section has been for Biology students; and the other for Chemistry, Mathematics and Physics students. This experiment has proved to be successful and as a result, the Department has rearranged its upper level course offerings so that it can afford to offer this course in Spring semesters.

Space

None.

Equipment

5. ApprovalDate: Dec. 5/73 28/Mr/74

A. M. Lorchman
Department Chairman

S. Ansoff
Dean

Chairman, SCUS

MATHEMATICS 154-3

Calculus for Biology Students

I. Real Number, Sets, Functions and Limits

- Section 1.0 Real Numbers, Order, Absolute Value
- 1.1 Sets, Set Notation, Operations with sets
 - 1.2 Functions (Polynomial Functions, Rational Functions)
 - 1.3 Addition, Multiplication, Division and Composition of functions
 - 1.4 Limits
 - 1.5 Increments and Rate of Change
 - 1.6 Review of Trigonometry (3 lectures)
 - 1.7 Limits of Trigonometric Functions
 - 1.8 Limit as x tends to Infinity

II. The Derivatives

- Section 2.1 Slope and Equation of Straight Lines
- 2.2 Continuous Functions
 - 2.3 The Derivative of a Function (Geometric and Physical Interpretation, Rate of Growth)
 - 2.4 The Derivative of Polynomials
 - 2.5 The Derivative of Products and Quotients
 - 2.6 The Derivative of Composite Functions
 - 2.7 The Derivative of $\sin u$ and $\cos u$
 - 2.8 Derivatives of $\tan u$, $\cot u$, $\sec u$ and $\csc u$
 - 2.9 Higher order Derivatives
 - 2.10 Exponential and Logarithmic Functions (See Seeley's Approach)

III. More About Derivatives and Their Applications

- Section 3.1 Curve Analysis
- 3.2 Maxima - Minima
 - 3.3 Applications of Maximum - Minimum
 - 3.4 The Differential
 - 3.5 Implicit Differentiation and Applications
 - 3.6 Inverse Functions
 - 3.7 Derivatives of the Inverse Trigonometric Functions
 - 3.8 Geometric Interpretation of Rolle's Theorem and the Mean Value Theorem

TEXT: Calculus for Business, Biology and the Social Sciences
by Crowdis, Shelley and Wheeler

SENATE COMMITTEE ON UNDERGRADUATE STUDIES

NEW COURSE PROPOSAL FORM

1. Calendar Information

Department: Mathematics

Abbreviation Code: _____ Course Number: 155-3 Credit Hours: 3 Vector: 3-1-0

Title of Course: Calculus II for the Biological Sciences

Calendar Description of Course:

The integral. Techniques of integration. Series. Differential equations, partial differentiation. Applications to the Biological Sciences.

Nature of Course Lecture/tutorial.

Prerequisites (or special instructions): Mathematics 150-3 (with a grade of A or B) or Mathematics 151-3 or 154-3. Students who have received credit for Mathematics 152-3 cannot receive credit for this course.

What course (courses), if any, is being dropped from the calendar if this course is approved:

None.

2. Scheduling

How frequently will the course be offered? Once per year in the Spring.

Semester in which the course will first be offered? Spring 1975.

Which of your present faculty would be available to make the proposed offering possible? All faculty members.

3. Objectives of the Course

The objective of the course is to make the study of calculus more relevant to students in Biological Sciences. The syllabus has been prepared on the assumption that those students who take the course will probably not take further courses in mathematics. For this reason a greater variety of topics are discussed in Math 155-3.

4. Budgetary and Space Requirements (for information only)

What additional resources will be required in the following areas:

Faculty There will be no net increase in faculty teaching time required for this course.
Staff For the past two years, the Department has offered separate sections of Math 152-3 in the Spring semesters, with one section being primarily for students in
Library Biological Sciences.

Audio Visual

Space

Equipment

None.

5. Approval

Date: Dec. 5/73.

28 / Mr / 74

A. M. Lachlan
Department Chairman

S. Ansoff
Dean

Chairman, SCUS

MATHEMATICS 155-3

Calculus for Biology Students

IV. Introduction to the Integral

- Section 4.1 Area Bounded by a Curve
- 4.2 Sigma Notation
- 4.3 Properties of the Integral
- 4.4 The Indefinite Integral
- 4.5 Indefinite Integrals - Trigonometric Functions

V. Integration

- Section 5.1 The Fundamental Theorem of Calculus
- 5.2 The Natural Logarithm
- 5.3 The Exponential Function
- 5.4 Integration by Parts
- 5.5 Trigonometric Substitutions
- 5.7 Improper Integrals
- 5.8* Use of semi-log and log-log graph papers, curve fitting

VI. Applications of Integration

- Section 6.1 Areas
- 6.2 Probability
- 6.3 Families of Curves, Parameters, Moments
- 6.4 Normal Curve Areas, Areas with Tables
- 6.8† Natural Growth and Decay

VII. Functions of Several Variables

- Section 7.1 Functions of Several Variables
- 7.2 Three-Dimensional Coordinate Geometry
- 7.3 Partial Derivatives
- 7.4 Extrema for Functions of Two Variables - Maximum and Minimum
- 7.5* Curve Fitting - Least Square Method

VIII.* Introduction to Ordinary Differential Equations

- Section 8.1 Differential Equations
- 8.2 First Order Differential Equations
- 8.3† Natural Growth and Decay
- 8.4 Systems of First Order Linear Differential Equations - Species Competition

IX.* Matrices and Vectors

Section 9.1 Matrix Notations
9.2 Matrix Algebra
9.3 Applications

* Materials which have to be supplemented by the instructor from sources other than the current textbook.

† This topic is covered twice.

TEXT: Calculus for Business, Biology and the Social Sciences
by Crowdis, Shelley and Wheeler

SIMON FRASER UNIVERSITY

MEMORANDUM

Faculty of Science
Subject: Calculus I and II Courses
and Prerequisites

From: David Ryeburn
Dept. of Mathematics
Date: March 20, 1974

Here is the prerequisite structure for Calculus courses, and courses dependent upon them.

<u>Course</u>	<u>Prerequisites</u>
142-2: Pure Mathematics II	141-2 (Pure Mathematics I), or 150-3, or 151-3, or 154-3
150-3: Calculus for Social Sciences	Math 12 (B.C. High Schools), or 100-3 (Survey of College Mathematics)
151-3: Calculus I	Math 12 (B.C. High Schools), or 100-3
152-3: Calculus II	150-3 (with a grade of A or B), or 151-3, or 154-3
154-3: Calculus I for the Biological Sciences	Math 12 (B.C. High Schools), or 100-3
155-3: Calculus II for the Biological Sciences	150-3 (with a grade of A or B), or 151-3, or 154-3
161-3: Statics	150-3, or 151-3, or 154-3 must precede or be taken concurrently
232-3: Elementary Linear Algebra	150-3, or 151-3, or 154-3
241-2: Pure Mathematics III	142-2, and either 152-3 or 155-3 Physics students may substitute 253-4 for 142-2
253-4: Calculus III	152-3, or 155-3 with a grade of A or B
371-3: Introduction to Probability	152-3

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NOTE: Students may not receive credit for more than one of the three courses 150-3, 151-3, 154-3, nor may they receive credit for more than one of the two courses 152-3 or 155-3.

Students are not normally permitted to enroll in courses unless prerequisite courses have been passed with a grade of C- or higher.

David Ryeburn
David Ryeburn

SIMON FRASER UNIVERSITY

MEMORANDUM

Dr. S. Aronoff
Dean of Science
Subject: NEW COURSE PROPOSALS - Math 194-3
and Math 196-3

From.. Dr. A. H. Lachlan, Chairman
Mathematics Department
Date..... December 3, 1973

Math 195-3 has been a fairly successful course and we have received numerous requests from both our faculty and our students for another Geometry course. Our proposal to replace Math 195-3 by two new courses Math 194-3 and Math 196-3 would satisfy this request and at the same time handle a problem with the old course. Math 195-3 tried to cover two separate areas of Geometry - classical Euclidean Geometry and Modern Geometry. Neither one of these interesting subjects could be done in sufficient depth to satisfy either the students or the faculty. We have in effect split Math 195-3 into two courses each covering one of these areas. The need for a course in Euclidean Geometry is all the more important now since the standard High School course (Grade 10) in Geometry has been all but scrapped.

A. M. Lachin

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SENATE COMMITTEE ON UNDERGRADUATE STUDIES

NEW COURSE PROPOSAL FORM

1. Calendar Information

Department: Mathematics

Abbreviation Code: _____ Course Number: 194-3 Credit Hours: 3 Vector: 3-1-0

Title of Course: Euclidean Geometry

Calendar Description of Course: Plane Euclidean geometry, congruence and similarity. Theory of parallels. Polygonal areas, Pythagorean Theorem. Geometrical constructions.

Nature of Course Lecture/tutorial

Prerequisites (or special instructions): Math 11 (B.C. Schools) or permission of the Department. Students who have obtained credit for Mathematics 195-3 cannot receive credit for Mathematics 194-3.

What course (courses), if any, is being dropped from the calendar if this course is approved:

Mathematics 195-3.

2. Scheduling

How frequently will the course be offered? Once every two years.

Semester in which the course will first be offered? Spring 75.

Which of your present faculty would be available to make the proposed offering possible? J.L. Berggren, H. Gerber

3. Objectives of the Course

Geometry is the basis of most of the mathematics done today. Courses in geometry are essential for a student's overall view of mathematics. The objective of this course is to teach the student the basic geometry of the Euclidean plane.

4. Budgetary and Space Requirements (for information only)

What additional resources will be required in the following areas:

Faculty - There will be no net increase in faculty teaching time required for this course, since it is a replacement for Math 195, and will be offered in alternate years.

Staff

Library

Audio Visual

Space

Equipment

None.

5. Approval

Date: Dec. 4/73.

28/Mr/74

C. H. Lockman
Department Chairman

S. Arnoff
Dean

Chairman, SCUS

MATHEMATICS 194-3

Euclidean Geometry

The object of this course is to teach the student the basic geometry of the Euclidean plane. It will include both theory and the constructions so that, by the end of the course, the student should have mastered enough theory to allow him to do fairly difficult constructions on a systematic basis. Some attention will also be paid to non-Euclidean and projective geometry and how these differ from Euclidean.

The topics covered, in order, and the approximate number of hours devoted to each are as follows:

Axioms of Plane Geometry	(1)
Congruence of Triangles	(2)
Theory of Parallels	(3)
Polygonal Areas	(3)
The Pythagorean Theorem and Some Generalizations	(1)
A Geometric Approach to Algebraic Identities and Quadratic Equations	(2)
The Geometry of the Circle	(4)
The Power of a Point with Respect to a Circle	(1)
The Construction of a Sine Table	(2)
The Construction of the Regular Pentagon, Inscribing Polygons in a Circle	(3)
A Theory of Proportion	(1)
Applications of this Theory to Similar Figures	(5)
A General Form of the Pythagorean Theorem	(1)
A Methodical Approach to Geometrical Constructions	(6)

PREREQUISITE: Math 11 (B.C. High School) or permission of the Department.

TEXT: Euclid's Elements, vols. I and II.

SENATE COMMITTEE ON UNDERGRADUATE STUDIES

NEW COURSE PROPOSAL FORM

1. Calendar Information

Department: Mathematics

Abbreviation Code: _____ Course Number: 196-3 Credit Hours: 3 Vector: 3-1-0

Title of Course: Modern Geometry

Calendar Description of Course:

Points and lines at infinity. The theorems of Menelaus and Ceva. Cross ratio. Harmonic division. Transformation theory of the plane.

Nature of Course Lecture/tutorial.

Prerequisites (or special instructions): Mathematics 11 (B.C. High Schools) or permission of the Department. Students who have obtained credit for Mathematics 195-3 cannot receive credit for Mathematics 196-3.

What course (courses), if any, is being dropped from the calendar if this course is approved: Mathematics 195-3.

2. Scheduling

How frequently will the course be offered? Once every two years.

Semester in which the course will first be offered? Spring 76.

Which of your present faculty would be available to make the proposed offering possible? J.L. Berggren, H. Gerber, B.R. Alspach.

3. Objectives of the Course

The object of this course is first to discuss the use of modern techniques, especially transformations, to obtain results in classical plane geometry. The second goal of this course is to introduce new geometries to the student. Much time is spent at the beginning of the course on elementary projective geometry.

4. Budgetary and Space Requirements (for information only)

What additional resources will be required in the following areas:

Faculty There will be no net increase in faculty teaching time required for this course since it is a replacement for Math 195, and will be offered in alternate years.

Staff

Library

Audio Visual

Space

Equipment

} None.

5. Approval

Date: Dec 5/73

28/Mr/74

G.H. Lachon
Department Chairman

S. Kruoff
Dean

Chairman, SCUS

MATHEMATICS 196-3

Modern Geometry

1. Sensed magnitudes
2. Infinite points and lines
3. The theorems of Menelaus and Ceva
4. Cross ratio
5. Harmonic division
6. Modern Elementary Geometry of the circle
7. Transformation theory of the plane
8. Applications of homothety
9. Isometrics and similarities
10. Inversion and applications of inversion

PREREQUISITE: Math 11 (B.C. High School) or permission of the Department.

TEXT: A Survey of Geometry (Revised Edition), Howard Eves, Allyn and Bacon